Reviewer Instructions for the Resource Management Strategies.

Thank you for taking the time to review the Resource Management Strategies; your thoughts and effort will improve the California Water Plan Update 2013. This March, these Resource Management Strategies are being circulated primarily amongst the active participants in the Water Plan process, our standing committees and caucuses. When your feedback is incorporated, the RMS will be re-released to the broad public.

Given the short feedback period, and our plans for additional feedback later, we ask that you focus your reviews this round. We welcome feedback with an emphasis on:

- Please do not comment on grammar or formatting; these versions will receive more editing later this year;
- Please point out opportunities for updating the RMS. If you are aware of relevant new projects, legislation, or developments, it would be great to hear about those;
- Please also point out new technologies that are relevant to an RMS;
- Please make suggestions for simplifying the recommendations;
- If you have suggestions for metrics that could measure progress for an RMS, we would like to lay the groundwork to include those in the next Progress Report and the Water Plan Update 2018.

Submit your feedback to the California Water Plan email address: cwpcom@water.ca.gov by April 15^{tht}. They'll be given to our Subject Matter Experts to incorporate into their RMS. If you have any questions, please contact Megan Fidell at mfidell@water.ca.gov.

Chapter Details — Draft

Authors or volume leads, please provide context and input to the publications staff in the space below. [Any notes to authors from the editing staff are provided within the text in gray highlighting or as comments.]	
Volume and chapter number	Volume 3, Chapter 13, "Surface Storage — Regional/Local"
Management objective	Increase Water Supply
Contact person	*Steve Cimperman*
Notes to editor	*Page 2: Summarize the Klamath decisions, place information about the SJR Restoration somewhere*
Design/graphics information	*Type any notes about the status of graphics, or any suggestions about photos/figures, here.*
Box information	This chapter currently has no related boxes.
Table information	This chapter currently has no related tables.
Glossary entries	*Type any terms/definitions here that you would like to see included in the glossary. Please ensure they are defined in the text of this chapter, too.*
Captions	*Type any captions for known photos here. Include the image's file name or description of photo.*
Recommended pull quotes	*Suggest pull quotes for this chapter here. (Pull quotes are bits of text that will be repeated in margins or elsewhere on the page, in a different font/size from the rest of the text. Typically, they should be no more than a couple of sentences and should be interesting/intriguing enough to serve as an additional entry point to pull readers in.) (Copy and paste pull quotes from the text of the chapter.)*
Column notes	*If additional information needs to appear in the margins (e.g., directional notes to readers, perhaps telling them where to find related content in other sections of Update 2013), type that information here and indicate what portion of the chapter it should accompany.*

Chapter 13. Surface Storage — Regional/Local

Surface storage uses reservoirs to collect water for later release and use. Surface storage has played an important role in California where the quantity, timing, and location of water use does not always match the natural runoff pattern. Many California water agencies rely on surface storage as a part of their water systems, and reservoirs also play an important role in flood control and hydropower generation. Similarly, surface storage is often necessary for, or can increase the benefits from, other water management strategies such as water transfers, conjunctive management, and conveyance improvements. Some reservoirs contribute to water deliveries across several regions of the state while others only provide local water deliveries within the same watershed. There are two general categories of surface reservoirs: those formed by damming an active river; and those called off-stream reservoir storage where a reservoir is in a separate location, requiring diversion or pumping of water from a river into storage.

Additional surface storage capacity can also be developed by enlarging, reoperating (see the System Reoperation narrative), or modifying existing reservoirs and their outlet structures. Smaller reservoirs typically store water annually in the winter for use in summer, while larger reservoirs also hold stored water over several years as a reserve for droughts or other emergencies. Over the last three decades reservoir operations have been most effected by the need to meet environmental regulations for the protection of impacted fish species. Today multiple benefit surface storage projects that balance hydropower production, water supply, flood protection, water quality, and ecosystem benefits are the norm.

The information in this chapter focuses on regional and local surface storage alternatives, but does not include the major storage investigations of the State and federal CALFED program, which are described separately in Chapter 12.

Surface Storage in California

(Notes–Update this section with DSOD data**)**

California has nearly 200 surface storage reservoirs greater than 10,000 acre-feet with a combined storage capacity of more than 41 million acre-feet.

These are tabulated in chronological order within Update 2009 Volume 4 Reference Guide section on Infrastructure. In addition, there are many more reservoirs smaller than 10,000 acre-feet that are used to provide for a wide range of water uses, stabilize water delivery to customers, and provide a backup supply for emergency needs. Most of the reservoirs in California were constructed more than 40 years ago, and the number of new reservoirs built has steadily declined since the 1960s. Only six new water supply reservoirs were constructed in California in the 1980s and 1990s, and only three have been completed since 2000. Examples of surface storage reservoirs recently completed by local/regional entities include: Olivenhain Reservoir in 2003 by San Diego County Water Authority, Diamond Valley Reservoir in 2000

by Metropolitan Water District of Southern California, Seven Oaks Reservoir by the US Corps of Engineers and Orange County Flood Control District in 1999, and Los Vaqueros Reservoir by Contra Costa Water District in 1998. The primary benefits of these new reservoirs are related to water supply reliability against catastrophic events and droughts, for operational flexibility to meet peak summer water demands, water quality improvement, and for flood control (Seven Oaks).

A few new surface storage reservoirs are actively being planned and evaluated to meet future needs in Southern California. Examples include the proposed enlargement of San Vicente Reservoir in San Diego County to add 152,000 acre-feet of storage, and the
US Bureau of Reclamation's proposed Drop 2 Storage Reservoir located on the north side of the All American Canal in Imperial County.

In other regions of the state, there are also several examples in which smaller, older, obsolete dams have been removed, primarily for the purpose of improving fish habitat and upstream access for salmon. Saeltzer Dam on Clear Creek (a tributary of the Sacramento River) is an example of this activity. Another major proposal under evaluation is the removal of several dams on the Klamath River in California and Oregon to aid streamflows and upstream migration of salmon. One of the reasons that removal of these existing dams is feasible is because newer more efficient alternatives now serve the projects original purposes for water diversion or hydropower generation.

During the past three decades, riverine habitats and fisheries downstream of many existing reservoirs have gradually received increased benefits due to changes in reservoir releases resulting from new regulations and legislation. Specifically, many existing reservoirs have been re-operated to achieve ecosystem and river recreation benefits beyond the original water supply needs. However, as the competing water demands for agricultural, urban, and environmental needs have grown, the operational flexibility of the state's surface water system has become more limited. Today's water system managers face a complex array of competing demands on the use of limited reservoir storage, which potentially results in more water reductions during droughts.

The relative need for additional local surface storage development may be greatest in the interior mountainous areas of the state such as the Cascades and the Sierra Nevada, also known as the Mountain Counties region. Although much of the water used throughout the state originates in the mountains, these locations generally possess limited groundwater supplies and a shorter list of water management strategies available to meet local needs. This is largely due to geographic, hydrogeologic, or hydrologic limitations. Of these few strategies, some form of new surface storage or enlargement of existing reservoir storage may hold the greatest potential for achieving local supply reliability objectives. Local surface storage development options could also include the reoperation of existing reservoirs through the development of water sharing or purchasing agreements with the downstream owners of existing reservoirs.

Potential Benefits of Surface Storage

Many of California's reservoirs were originally built for the primary purposes of hydropower, flood control, and consumptive water use. However, over time the benefits required of surface storage have

generally expanded to include the following:

- Water quality management
- System operational flexibility
- Hydroelectric power generation
- Flood management
- Ecosystem management
- Sediment transport management
- River and lake recreation
- Water supply augmentation
- Emergency water supply

The presence of new surface storage allows water managers the flexibility to implement other water management strategies easier, more efficiently, or implement strategies simply not available without storage. Storage helps solve the temporal problem that occurs when the availability of water and the demand don't occur at the same time. Often in region conservation efforts are ineffective if the water conserved can't be stored for later use. Storage allows water transfers between regions to occur at any time not just when the water is needed for immediate use. In additionally, water transfers early in the water year are generally less expensive than later transfers. Surface storage is needed to enable and improve the effectiveness of conjunctive water management strategies by controlling the timing and volume of water ultimately conveyed for storage in groundwater basins. If timed appropriately any increased instream flows can provide ecosystem benefits as well.

With regard to anticipated climate change impacts, new surface storage has the potential to provide greater flexibility for capturing surface water runoff and managing supplies to meet varied future water demands. Climate change projections foresee more extreme weather such as floods and droughts. Climate change models predict that warming temperatures will raise the snowfall elevation, so that more winter precipitation in the Sierra Nevada will occur as rainfall and create larger and earlier runoff events. Several million acre feet of natural snow pack storage could be lost. By expanding surface storage capacity, water supply systems will have greater flexibility to capture the increased winter runoff and help control larger anticipated flood flows. Additional reserve storage would allow water to be held over for all usesbe in dry years and droughts.

Potential Costs of Surface Storage

Cost estimates for potential surface storage alternatives are not specified in this narrative because they vary extensively by region and specific project design. In most cases, the costs of multipurpose storage projects are shared by many beneficiaries, and often include a State or federal cost-share component. The magnitude of individual project benefits and corresponding costs for new water supply, hydropower, water quality, and flood management can be expected to vary significantly from project to project, so that average cost information is not accurate.

Major Issues Facing Surface Storage

Climate Change

Mitigation

Adaptation

Funding and Identifying Project Beneficiaries

Construction usually requires a substantial amount of money in a short time – perhaps $1 billion or more over five years for larger projects. Included in the long-term capital outlay are planning costs such as administrative, engineering, legal, financing, permitting and mitigation, which can also require significant investments. Some new storage options, such as raising existing reservoirs, reoperating them, or constructing small local reservoirs, may require significantly less capital, but may require local funding through revenue or general obligation bonds. Even these less costly projects could face financial challenges.

There are concerns related to how the beneficiaries will be determined, who will actually pay, and who will control the storage operation. One financing concept assumes that only the direct beneficiaries of a proposed storage project should pay for the cost of construction and operation. However, many of the beneficiary groups do not have adequate financial resources to build large projects without outside financial assistance, and many proposed projects have been deferred due to lack of funding.

Another general financing concept relies on a large percentage of State and /or federal funding support to assist in the construction on new projects. When this method is proposed, the project beneficiaries will have a smaller, more affordable component of project costs to fund. However, the process of obtaining funding approval from either federal or State government agencies generally requires substantially more time and justification documents. The challenge is to develop financial and operations agreements that have the best possibility for successful allocation of project costs that correspond to the beneficiaries and uses of a given project.

Impacts

New storage can affect environmental and human conditions and can create economic impacts for the surrounding community and flow impacts both up and downstream of diversions. New reservoirs may result in the loss of property tax revenue to local governments in the area they are located or in an increase of local property values by firming up a water supply. Regulatory and permitting requirements require surface storage investigations to consider potential impacts to streamflow regimes, potential adverse effects on designated wild and scenic rivers, potential water quality issues, potential changes in stream geomorphology, loss of fish and wildlife habitat, and risk of failure during seismic and operational events. Existing environmental laws require that these types of effects be mitigated. Mitigation of environmental effects is normally accomplished through implementation strategies that avoid, minimize, rectify, reduce over time, or compensate for negative impacts. New surface storage projects are required to address impacts under the application of various laws, regulatory processes and statutes such as Public Trust Doctrine, State dam safety standards, Area of Origin statutes, California Environmental Quality

Act, National Environmental Protection Act, the Clean Water Act, and the Endangered Species Acts.

Suitable Sites and Collaboration

Most of the best natural reservoir sites in California have already been developed, and environmental regulations and mitigation requirements impose significant constraints to development of new surface storage in the mountains of California. In some areas, the development of new offstream storage is a feasible alternative, if the geographic terrain provides suitable locations. However, potential offstream storage sites must be carefully evaluated to include impacts to existing regional development and physical terrain obstructions.

Another option that is receiving more consideration in recent years involves the rehabilitation and enlargement of existing older reservoirs. This has the advantage of using an established reservoir site, but the feasibility and costs for rehabilitation of an older facility must be carefully evaluated. The range of surface storage development options is generally less limited for smaller local agencies than for the State and federal governments, because state and federal projects generally are larger and therefore there are fewer available sites. Limited agency funding and staff resources impact local agencies' capability to complete complex feasibility studies, design documents, environmental impact studies, and related project planning needs. These circumstances severely constrain the ability of local governments and agencies to finance and implement the projects necessary to sustain the local economy, preserve or restore riparian habitats and provide water supplies for regional population growth. Traditionally small local agencies have been unwilling to fund projects outside their service areas. However, recently local partnerships through Integrated Regional Water Management Agencies have pooled resources and collaborated on local shared storage projects aimed at benefiting all regional participants.

(Notes: Should call:

- EBMUD
- CCWD
- Yuba
- Garden Bar
- Survey
- Delta wetlands)

Recommendations to Better Manage and Increase Surface Storage Benefits

1. Local agencies seeking to implement storage projects should develop a comprehensive methodology for analyzing all benefits and full costs of projects. The California Department of Water Resources should provide guidance, technical expertise, and planning process assistance to local agencies if requested.
2. Reservoir operators and stakeholders should continue to adaptively manage operations of existing facilities in response to increased understanding of system complexities and demands as well as changes in natural and human considerations such as social values, hydrology, and climate change.

3. The Department of Water Resources and other State, federal, and local resource management agencies should continue studies, research, and dialogue focused on a common set of tools that would help determine the full range of benefits and impacts as well as the costs and complexities of surface storage projects.
4. Water resources scientists, engineers, and planners, including DWR, should recognize the potential long development time required for new surface storage in securing funding needed for continuity of planning, environmental studies, permitting, design, construction, and operation and maintenance.
5. Rehabilitation and possible enlargement of existing older dams and infrastructure should be given full consideration as an alternative to new reservoir storage.
6. As an alternative to new storage, agencies should consider the potential to develop water purchasing agreements to buy water from other agencies that own storage reservoirs with substantial water supplies.
7. Investigate integrating existing surface storage with groundwater management.
8. Team with other regional agencies through IRWM agencies on new regional storage projects.

Regional/Local Surface Storage in the Water Plan

[Authors, this is a new heading for Update 2013. If necessary, this section will discuss the ways the resource management strategy is treated in this chapter, in the regional reports and in the sustainability indicators. If the three mentions aren't consistent, the reason for the conflict will be discussed (i.e., the regional reports are emphasizing a different aspect of the strategy). If the three mentions are consistent with each other (or if the strategy isn't discussed in the rest of Update 2013), there is no need for this section to appear.]

References

DSOD spreadsheet info

Bulletin 17 -2000 info

EBMUD –Board hearing

CCWD Webpage/EIR/Board Resolution

[Authors, for Update 2013, the "References" section will have the following subheadings: "References Cited" (for references that have in-text citations), "Additional References" (for additional materials that either the author consulted but did not cite or that readers may appreciate generally), and "Personal Communications" (for personal communications that you have documented using the form for that purpose; if you have not documented such communications, just use attribution in the narrative and do not include an entry in the bibliography). For now, the references provided for Update 2009 have been placed under the "References Cited" subhead. If they are no longer cited in the text after the text has been updated for 2013, place them under the "Additional References" subheading instead or delete them altogether. In general, legal references (statutes, codes, acts, etc.) do not need to be included within this section and can instead be described within the narrative above. Additional guidance on references and

citations is contained within California Water Plan Update 2013: Publications Process and Style Guide, *available from volume leads.]*

References Cited

California Department of Water Resources, California Floodplain Management Task Force, December 2002 State of California, General Plan Guidelines, 2002

USDA Natural Resources Conservation Service, Field Office Technical Guide (of conservation practices), (http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=CA)

Additional References

Personal Communications

The text below is for publications staff use only. This text will not appear in the final version of this document.

Publications staff: Acronyms and abbreviations will be presented for each chapter individually. References for citations will appear within each chapter, as well. Use the lists below to create acronym tables for each chapter, generate tables of contents, and crosscheck information within the text.

Right-click in the field and then select "Update Field" and "Update Entire Table."

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